CLAIMS

1. An infrared lamp comprising:

a carbon-based heating element obtained by mixing a carbon composition having compactibility and a carbon yield of substantially nonzero after firing with at least one kind of metallic or semi-metallic compound and then by firing, wherein the change rate of the electric specific resistance of said carbon-based heating element, at a high temperature in lit state with respect to the electric specific resistance at a normal temperature in unlit state is set in the range from -20% to +20%,

lead wires electrically connected to both ends of said carbon-based heating element, and

a quartz glass tube accommodating said carbon-based heating element so that the ends of said lead wires are extended outside said quartz glass tube, said quartz glass tube being filled with an inert gas and sealed.

2. An infrared lamp in accordance with claim 1, wherein the metallic or semi-metallic compound included in said carbon-based heating element is at least one kind of compound selected from the group consisting of metallic carbide, metallic boride, metallic silicide, metallic nitride, metallic oxide, semi-metallic nitride, semi-metallic oxide and semi-metallic carbide.

3. An infrared lamp in accordance with claim 1,

wherein the composition of said carbon-based heating element includes resins.

4. An infrared lamp in accordance with claim 1, wherein the composition of said carbon-based heating element includes at lead one kind of powder selected from the group consisting of carbon black, graphite and coke powder.

5. An infrared lamp in accordance with claim 1, wherein said lead wires are electrically connected to the current passing portions of said carbon-based heating element via connection members having an inherent resistance smaller than that of said carbon-based heating element and larger than that of said lead wire, the lead wire are inserted into said quartz glass tube so that the ends thereof are extended outside said quartz glass tube, and said quartz glass tube is filled with an inert gas and sealed.

6. An infrared lamp in accordance with claim 5, wherein said connection members are formed of a carbon-based substance.

7. An infrared lamp in accordance with claim 5, wherein said lead wire is a metallic wire selected from among a tungsten wire, a molybdenum wire and a stainless steel wire.

8. An infrared lamp in accordance with claim 5,

wherein a coil spring portion having a diameter almost close to the inner diameter of said quartz glass tube is provided on at least one of said lead wires connected to both ends of said carbon-based heating element so as to apply a tension to said carbon-based heating element.

9. An infrared lamp in accordance with claim 5, wherein said quartz glass tube is filled with one of argon, nitrogen and a mixture gas of argon and nitrogen.

10. An infrared lamp comprising:

a long heating element obtained by connecting a plurality of heating elements, in series via connection terminals, said heating elements being formed of a sintered body including a carbon-based substance,

electrode terminals connected to both ends of said long heating element, and

a heating element assembly obtained by electrically connecting one ends of internal lead wires to said electrode terminals and by connecting the other ends of said internal lead wires to one ends of intermediate terminal plates.

11. An infrared lamp in accordance with claim 10, wherein said heating element assembly is inserted into a heat-resistant transparent glass tube, said intermediate terminal plates are sealed in sealing portions of said heat-resistant transparent glass tube, and external lead

wires extended outside said heat-resistant transparent glass tube are connected to the other ends of said intermediate terminal plates.

12. An infrared lamp comprising:

electrode terminals disposed at both ends of each of a plurality of heating elements each formed of a sintered body including a carbon-based substance, and

a heating element assembly obtained by connecting at least one electrode terminal of a heating element to at least one electrode terminal of another heating element via a connection terminal thereby to form a long heating element, by connecting said electrode terminals at both ends of said long heating element to one ends of internal lead wires , and by connecting the other ends of said internal lead wires to intermediate terminal plates.

13. An infrared lamp in accordance with claim 12, wherein said heating element assembly (is inserted into a heat-resistant transparent glass tube, said intermediate terminal plates are sealed at the sealing portions of said heat-resistant transparent glass tube, and external lead wires extended outside said heat-resistant transparent glass tube are connected to the other ends of said intermediate terminal plates.

14. An infrared lamp in accordance with claim 12,

wherein said connection terminal or electrode terminals are formed of a sintered body including a carbon-based substance.

15. An infrared lamp in accordance with claim 12, wherein said connection terminal is formed of a coil-shaped tungsten-based substance or a coil-shaped molybdenum-based substance.

16. An infrared lamp in accordance with claim 13, wherein said heat-resistant transparent glass tube enclosing said heating element is filled with a gas including at least an inert gas substance or a nitrogen gas substance.

17. An infrared lamp in accordance with claim 14, wherein said connection terminal has a shape being concentric with said heating element and said heat-resistant transparent glass tube, and is disposed so that a predetermined clearance is provided between said connection terminal and the inner wall of said heat-resistant transparent glass tube.

18. An infrared lamp in accordance with claim 10, wherein said heating element assembly is formed of a plurality of heating elements having different heating values.

19. An infrared lamp in accordance with claim 10, wherein said heating element is a plate-shaped heating

element, the cross-sectional shape of said plate-shaped heating element is a rectangle, the ratio of the thickness to the width of the rectangle is 1:5 or more, and the direction of the longer side of the rectangular cross-section of at least one of said plurality of plate-shaped heating elements is different from those of the other plate-shaped heating elements. (FIG. 9A)

20. A method of producing an infrared lamp comprising the steps of:

connecting a connection terminal to at least one end of each of a plurality of heating elements formed of a sintered body including a carbon-based substance,

forming one long heating element by connecting said heating element having said connected connection terminal to other heating elements via connection terminals,

connecting a pair of electrode terminals to both ends of said long heating element,

electrically connecting one end of an internal lead wire, the other end of which is connected to one end of an intermediate terminal plate, to each of said electrode terminals,

forming a heating element assembly by connecting an external lead wire to the other end of said intermediate terminal plate, and

inserting said heating element assembly into a

heat-resistant transparent glass tube, filling said heat-resistant transparent glass tube with an inert gas, melting both ends of said heat-resistant transparent glass tube and sealing said heat-resistant transparent glass tube at said intermediate terminal plates of said heating element assembly.

21. A method of producing an infrared lamp comprising the steps of:

connecting electrode terminals to both ends of each of a plurality of heating elements formed of a sintered body including a carbon-based substance,

forming one long heating element by connecting said electrode terminals of said heating elements connected by said electrode terminals via connection terminals,

electrically connecting one end of an internal lead wire, the other end of which is connected to one end of an intermediate terminal plate, to said electrode terminal of each of both ends of said long heating element,

forming a heating element assembly by connecting one end of an external lead wire to the other end of said intermediate terminal plate, and

inserting said heating element assembly into said heat-resistant transparent glass tube, filling said heat-resistant transparent glass tube with an inert gas, melting both ends of said heat-resistant transparent glass

tube and sealing said heat-resistant transparent glass tube at said intermediate terminal plates of said heating element assembly.

22. A heating apparatus having an infrared lamp, wherein an object to be heated is disposed in parallel with the axial direction of said infrared lamp.

23. An infrared lamp comprising:

a heating element assembly obtained by installing a plurality of terminals on at least one wire-shaped long heating element formed of a sintered body including a carbon-based substance, by connecting a pair of electrode terminals to both ends of said long heating element, by electrically connecting one ends of internal lead wires to said electrode terminals and by connecting the other ends of said internal lead wires to one ends of intermediate terminal plates.

24. An infrared lamp in accordance with claim 23, wherein said heating element assembly is inserted into said heat-resistant transparent glass tube, said intermediate terminal plates are sealed at the sealing portions of said heat-resistant transparent glass tube, and external lead wires extended outside said heat-resistant transparent glass tube are connected to the other ends of said intermediate terminal plates.

25. An infrared lamp in accordance with claim 1,

wherein more carbon is contained in the surface layer than in the inside of said heating element.

26. A warming apparatus provided with a plurality of said infrared lamps in accordance with claim 25 at the upper, lower or side position of the housing of said apparatus or at said plurality of positions of said housing.

27. A drying apparatus provided with a plurality of said infrared lamps in accordance with claim 25 at the upper, lower or side position of the housing of said apparatus or at said plurality of positions of said housing.

28. A heating apparatus provided with a plurality of said infrared lamps in accordance with claim 25 at the upper, lower or side position of the housing of said apparatus or at said plurality of positions of said housing.

29. A cooking apparatus provided with a plurality of said infrared lamps in accordance with claim 25 at the upper, lower or side position of the housing of said apparatus or at said plurality of positions of said housing.

30. A medical apparatus provided with a plurality of said infrared lamps in accordance with claim 25 at the upper, lower or side position of the housing of said apparatus or at said plurality of positions of said

housing.